

Short communication

Medical treatment of food allergies should be personalized



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1. Food and food allergies

Food is very important for maintaining homeostasis and is particularly crucial to the growth and development of infants. The act of eating can also reward individuals with feelings of satisfaction, while not eating can induce severe stress; therefore, eating is of the utmost importance to both body and mind. However, food may also occasionally be the cause of allergies. Allergies induced by food are called food allergies. When an individual ingests food that triggers an allergic reaction that manifests as allergic symptoms, this event is referred to as a food allergy. In such cases, the “individual” is the person who experiences the food allergy, and the “food” is what is referred to as a food allergen. To illustrate, if an individual were to ingest milk, beef, fish, and soybeans without the occurrence of allergic symptoms, but an allergic reaction manifesting as symptoms occurred upon ingesting eggs, the eggs would be a “food allergen” to this individual. On the contrary, if another individual ate eggs without any symptoms, but symptoms emerged after ingesting milk, the milk would be a food allergen to this individual. The proteins contained in the respective foods function as food allergens inside the body.

2. Definition of food allergy

Adverse reactions caused by ingesting food vary mechanistically: there are allergic reactions (immunological reactions), abnormal metabolic responses, food poisons, and more. The Japanese Pediatric Guidelines for Food Allergies 2012, published by the Japanese Society of Pediatric Allergies and Clinical Immunology, provided the following definition of a food allergy: “A phenomenon in which adverse reactions are caused through antigen-specific immunological mechanisms after exposure to given food” [1].

3. Personalized medicine

Personalized medicine is medical treatment tailored to each patient according to different etiologies, pathogenesises, symptoms, responses to treatment, and side effects, as well as different predispositions, in order to make the treatment more effective. Some of these differences are based on genetics, but some may not be. Recently, personalized medicine has been utilized for some diseases, including breast cancer and lung cancer [2,3]. Moreover, the use of personalized medicine has been reported for drug allergies, bronchial asthma, and allergic rhinitis [4–7]. The difference in each patient is judged based on criteria such as biomarkers and clinical symptoms, as well as genetics. In the near future, some of these markers may be corroborated by genetic and epigenetic studies.

4. Medical treatment of food allergies should be personalized

In patients with food allergies, the etiology, pathogenesis, symptoms, natural history, and prognosis vary for each patient [8,9]. Therefore, medical treatment of food allergies should be personalized or “tailor-made” for each patient.

(1) Allergens

Allergens vary by patient. The number of allergens also vary—one patient may have only one allergen, whereas other patients may have two or more allergens. The kind of allergen also depends on the patient—eggs for one patient and milk, wheat, kiwi, soybeans, or peanuts for other patients (Table 1). Moreover, whether

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Table 1
Various allergens.

Hen's egg	
Cow's milk	
Wheat	
Kiwi	
Soybeans	
Peanuts	etc.

the food functions as an allergen or not in each patient depends on the amount consumed and the cooking conditions (for example, raw vs. boiled eggs).

(2) Pathogenesis

The pathogenesis also differs by patient. Clinically, the pathogenesis is divided into immediate, non-immediate, or both (Fig. 1) [10]. The mechanisms involved are divided into categories such as IgE-mediated or non-IgE-mediated. In the classification by Coombs and Gell, allergic reactions are divided into 4 types: I, II, III, and IV (Table 2).

(3) Symptoms

Allergy symptoms also vary by patient. Duration from the intake of the food allergen to the onset of symptoms differs from less than 1 h to more than 1 h, depending on the patient. Parts of the body where symptoms occur are different in each patient, such as on the skin; in the oral mucosa, respiratory system, intestinal system, or neurological system; or over the whole body. Moreover, symptoms manifesting on the skin may occur in different locations such as the face, back, and arms. Skin manifestations are also displayed in various ways, such as urticaria, erythema, or eczema. The severity of each symptom also varies from patient to patient.

Clinical features caused by the symptoms also vary by patient.

—for example, on the skin: urticaria, angioedema, atopic dermatitis; in the oral mucosa: oral allergy syndrome; in the respiratory organs: cough, wheezing, bronchial asthma, dyspnea; in the intestinal organs: nausea, vomiting, diarrhea; in the neurological system: headaches, allergic tension fatigue syndrome; on the eye: conjunctivitis, conjunctival edema; on the nasal organs:

Table 2
Classification of allergic reactions (Coombs and Gell).

Type I	Anaphylaxis (immediate)
Type II	Antibody-mediated cytotoxic reactions
Type III	Immune complex-mediated reactions
Type IV	Delayed type hypersensitivity

allergic rhinitis; over the whole body: anaphylaxis, anaphylactic shock, food-dependent exercise-induced anaphylaxis (Table 3) [1].

(4) Complications

Complications also vary. For example, bronchial asthma may or may not occur in response to mites or allergic rhinitis in response to pollen.

(5) Natural Course and Prognosis

The natural course and prognosis are quite different in each patient. In some patients, food allergies are cured and disappear around the age of two or three years, whereas in other patients, food allergies do not improve and continue into adulthood. This difference may be due to differences in factors such as the kind of allergens or different predispositions. Moreover, some patients first develop food allergies in adulthood.

(6) Personalized management

Therefore, medical treatment of food allergies should be personalized or “tailor-made” for each patient.

A recent concept is that elimination of certain foods that contain food allergens should be minimized in order to maintain sufficient nutrition. However, the manner in which certain foods are eliminated also varies from patient to patient. For example, some patients may have to eliminate milk, while others may have to eliminate eggs or wheat. The amount that can be consumed and the cooking conditions to avoid also vary by patient.

(7) Responsiveness to treatment

Furthermore, responses to treatment vary. While some patients develop immune tolerance in response to a variety of treatments such as oral immunotherapy, other patients are resistant to developing such immune tolerance. Consequently, treatment methods require ingenuity and the development of new products, such as the development of allergen-modified milk, in which the T cell epitope is not digested, but the B cell epitope is digested; moreover, there are differences in how the treatments should be used.

5. Conclusion

As expressed above, the medical treatment of food allergies should be personalized or “tailor-made” for each patient. Effective

Table 3
Clinical features (symptoms).

Skin	: urticaria, angioedema, atopic dermatitis, etc.
Oral mucosa	: oral allergy syndrome, etc.
Respiratory organs	: cough, wheezing, bronchial asthma, dyspnea, etc.
Intestinal organs	: nausea, vomiting, diarrhea, etc.
Neurological system	: headaches, allergic tension fatigue syndrome, etc.
Eye	: conjunctivitis, conjunctival edema, etc.
Nasal organs	: allergic rhinitis, etc.
Whole body	: anaphylaxis, anaphylactic shock, food dependent exercise-induced anaphylaxis, etc.

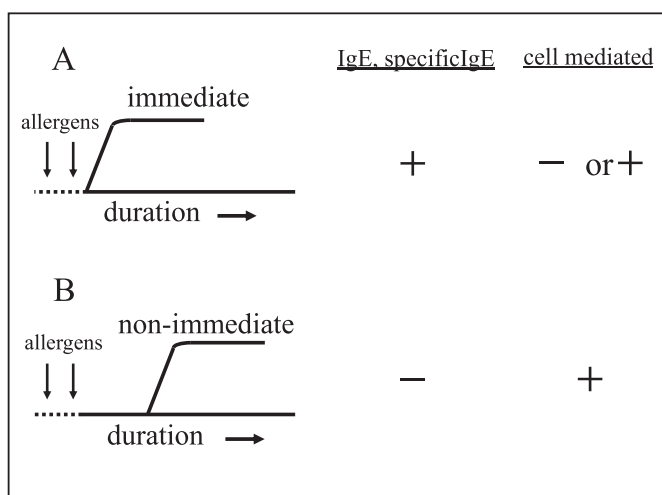


Fig. 1. Immediate and non-immediate types of food allergy. Duration from the intake of food to the onset of symptoms differs. Symptoms occur from less than 1 h (immediate type) to more than 1 h (non-immediate type) following food allergen ingestion.

and sufficient medical treatment of food allergies is not obtainable without such personalized treatment. In the near future, some of the differences in food allergies described above may be corroborated by genetic and epigenetic studies.

Disclosure of potential conflict of interest

The author declares that he has no relevant conflicts of interest.

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